

## DESCRIPTION

The MP3361 is a fast, highly efficient and precision high voltage Xenon photo-flash charger for Digital Still Cameras (DSC).

The MP3361 features a 1A peak current and charges to 300V in 4 seconds from 4.2V battery voltage. A 60V, 0.5Ω internal power switch lowers transformer turns ratio and switching losses associated with the primary leakage inductance and winding capacitance. Integrated secondary feedback resistors provide +/-3% output voltage charge accuracy.

## FEATURES

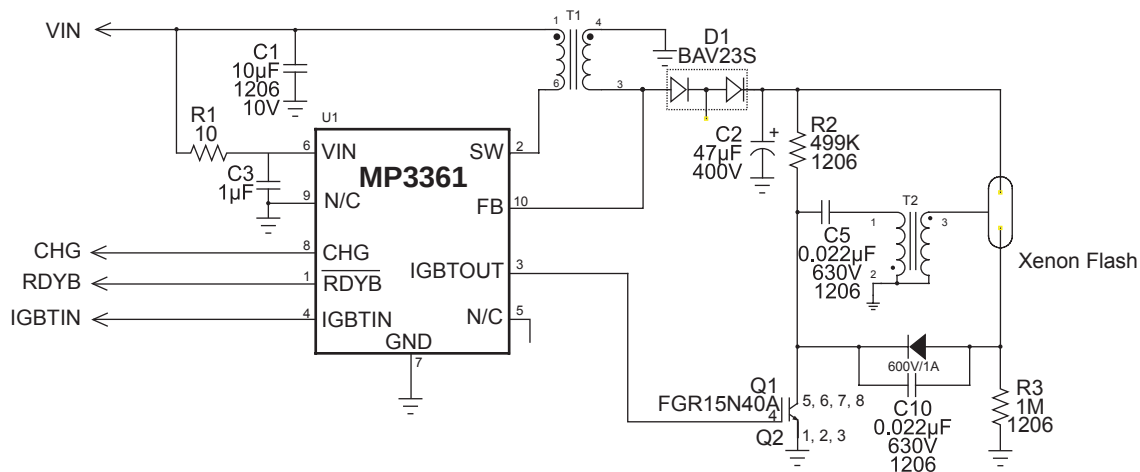
- Integrated 60V, 0.5Ω Power Switch
- 1A Peak Charge Current
- 3.5% Charge Accuracy
- <1uA Shutdown Current
- Integrated IGBT Driver

## APPLICATIONS

- Digital Still Cameras
- Optical Film Cameras
- PDAs with Xenon Flash

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## TYPICAL APPLICATION



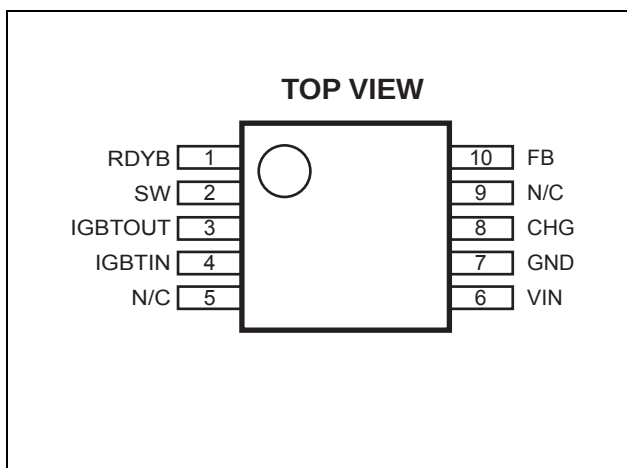
## ORDERING INFORMATION

| Part Number* | Package      | Top Marking | Free Air Temperature (T <sub>A</sub> ) |
|--------------|--------------|-------------|----------------------------------------|
| MP3361       | 3x3mm MSOP10 | 3361D       | –40°C to +85°C                         |

\*For Tape & Reel, add suffix –Z, (e.g. MP3361DK–Z);

For RoHS Compliant Packaging, add suffix –LF, (e.g. MP3361DK–LF–Z)

## PACKAGE REFERENCE



## ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

|                                                                               |                 |
|-------------------------------------------------------------------------------|-----------------|
| V <sub>IN</sub> to GND .....                                                  | –0.3V to 6V     |
| CHG, IGBTIN, IGBTOUT,<br>RDYB to GND .....                                    | –0.3V to 6V     |
| FB to GND .....                                                               | –60V to 350V    |
| SW to GND .....                                                               | –0.3V to 60V    |
| Storage Temperature.....                                                      | –55°C to +150°C |
| Continuous Power Dissipation (T <sub>A</sub> = +25°C) <sup>(2)</sup><br>..... | 2.5W            |
| Junction Temperature .....                                                    | +150°C          |
| Lead Temperature (Solder).....                                                | +260°C          |

## Recommended Operating Conditions <sup>(3)</sup>

|                                               |                 |
|-----------------------------------------------|-----------------|
| Supply Voltage V <sub>IN</sub> .....          | 2.5V to 6V      |
| Operating Junt. Temp. (T <sub>J</sub> ) ..... | –40°C to +125°C |

|                                          |                       |                       |
|------------------------------------------|-----------------------|-----------------------|
| <b>Thermal Resistance <sup>(4)</sup></b> | <b>θ<sub>JA</sub></b> | <b>θ<sub>JC</sub></b> |
| 3x3mm MSOP10.....                        | 150                   | 65                    |

### Notes:

- Exceeding these ratings may damage the device.
- The maximum allowable power dissipation is a function of the maximum junction temperature T<sub>J</sub> (MAX), the junction-to-ambient thermal resistance θ<sub>JA</sub>, and the ambient temperature T<sub>A</sub>. The maximum allowable continuous power dissipation at any ambient temperature is calculated by P<sub>D</sub> (MAX) = (T<sub>J</sub> (MAX)–T<sub>A</sub>)/θ<sub>JA</sub>. Exceeding the maximum allowable power dissipation will cause excessive die temperature, and the regulator will go into thermal shutdown. Internal thermal shutdown circuitry protects the device from permanent damage.
- The device is not guaranteed to function outside of its operating conditions.
- Measured on JESD51-7 4-layer board.

## ELECTRICAL CHARACTERISTICS

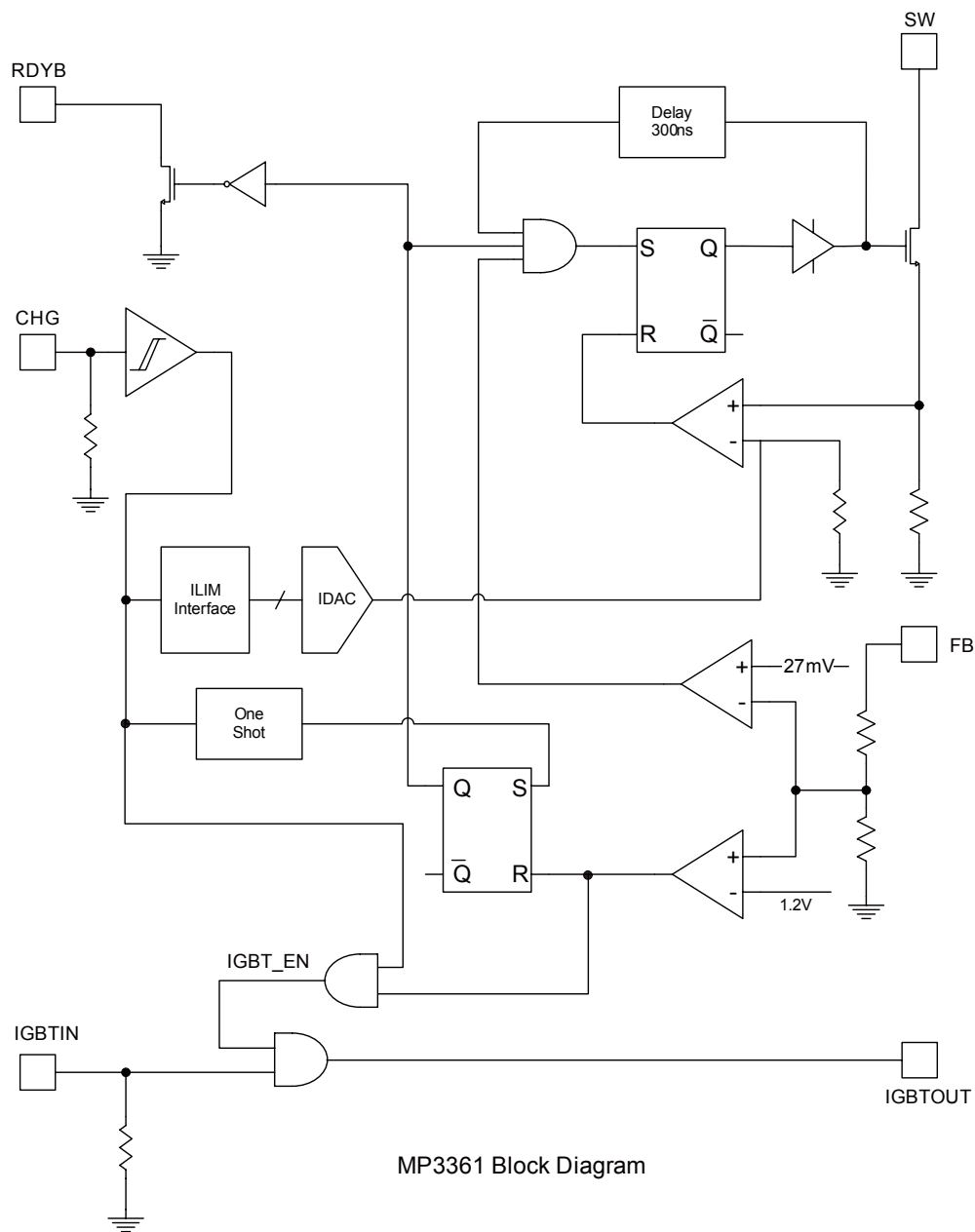
$V_{IN} = V(\text{Charge}) = 3.6V$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

| Parameter                              | Conditions                                             | Min | Typ  | Max | Unit       |
|----------------------------------------|--------------------------------------------------------|-----|------|-----|------------|
| <b>Photoflash Capacitor Charger</b>    |                                                        |     |      |     |            |
| $V_{IN}$ Voltage Range                 |                                                        | 2.5 |      | 6   | V          |
| $V_{IN}$ UVLO                          | Rising edge, hysteresis = 200mV typical                |     |      | 2.5 | V          |
| $V_{IN}$ Quiescent Current (active)    | $V(\text{CHARGE})=\text{High}$ , $V(\text{FB}) = 0$    |     | 1    | 2   | mA         |
| $V_{IN}$ Quiescent Current (standby)   | $V(\text{CHARGE})=\text{High}$ , $V(\text{FB}) = 336V$ |     |      | 100 | $\mu A$    |
| Shutdown Current from $V_{IN}$         | $V(\text{CHARGE})=\text{Low}$ , $V_{IN}=3.6V$          |     |      | 1   | $\mu A$    |
| $V_{SW}$ Leakage Current               | $V_{IN}=3.6V$ , $V_{SW}=60V$ , in Shutdown             |     |      | 1   | $\mu A$    |
| SW ON Resistance between SW and GND    | Switch turn-on                                         |     | 0.5  |     | $\Omega$   |
| Pull-down Resistance of CHARGE pin     | $V(\text{CHARGE})=3.6V$                                |     | 100k |     | $\Omega$   |
| IPEAK                                  |                                                        |     | 1.0  | 1.2 | A          |
| Charge completion detect voltage at FB |                                                        | 285 | 295  | 305 | V          |
| FB Resistance                          | $V(\text{FB})=30V$                                     |     | 285  |     | k $\Omega$ |
| DCM Comparator threshold               |                                                        |     | 5    |     | V          |
| RDYB Leakage Current                   | $V(\text{RDYB})=3.6V$                                  |     |      | 1   | $\mu A$    |
| RDYB Output Low Voltage                | ISINK= 2mA                                             |     | 0.2  |     | V          |
| MAX TON                                | Maximum TON time                                       |     | 70   |     | $\mu s$    |
| Thermal Shutdown                       | Rising edge, hysteresis = $15^\circ C$                 |     | 150  |     | $^\circ C$ |
| Charge Input High Voltage              |                                                        | 1.4 |      |     | V          |
| Charge Input Low Voltage               |                                                        |     |      | 0.5 | V          |
| IGBTOUT pull-up ON resistance          |                                                        |     | 5    |     | $\Omega$   |
| IGBTOUT pull-down ON resistance        |                                                        |     | 6    |     | $\Omega$   |
| IGBTIN Input High Voltage              |                                                        | 1.4 |      |     | V          |
| IGBTIN Input Low Voltage               |                                                        |     |      | 0.5 | V          |
| Propagation delay                      | $C_{gate}=6800pF$                                      |     | 50   |     | ns         |
| IGBT Pulse Width                       |                                                        | 1   |      |     | $\mu s$    |
| IGBTOUT rise time                      | $C_{gate}=6800pF$                                      |     | 130  |     | ns         |
| IGBTOUT fall time                      | $C_{gate}=6800pF$                                      |     | 180  |     | ns         |
| Pull down resistance of IGBTIN         |                                                        |     | 100k |     | $\Omega$   |

## PIN FUNCTIONS

| Pin | Name    | Function                                                                                                            |
|-----|---------|---------------------------------------------------------------------------------------------------------------------|
| 1   | RDYB    | Open-Drain Power-Ready Output. RDYB becomes low when the output voltage is reached.                                 |
| 2   | SW      | Switch Pin. This is the drain of the internal power switch.                                                         |
| 3   | IGBTOUT | Output Drive for IGBT Gate. Connect this pin to the gate of the IGBT.                                               |
| 4   | IGBTIN  | Logic Input for IGBT Drive.                                                                                         |
| 5,9 | N/C     |                                                                                                                     |
| 6   | VIN     | Input Supply Pin. Connect it to system supply voltage. Bypass VIN to GND with a 0.1uF or greater ceramic capacitor. |
| 7   | GND     | Ground                                                                                                              |
| 8   | CHG     | A Logic LOW disables the part. Logic Hi Enables the part                                                            |
| 10  | FB      | Freeback Pin. Its trip voltage is 295V typical.                                                                     |

## BLOCK DIAGRAM



MP3361 Block Diagram

**Figure 1—Function Block Diagram**

## OPERATION

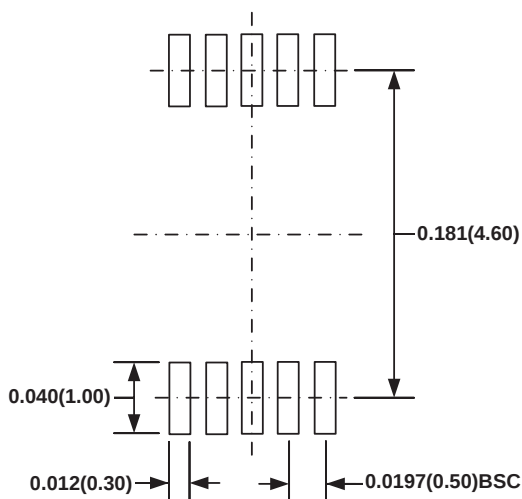
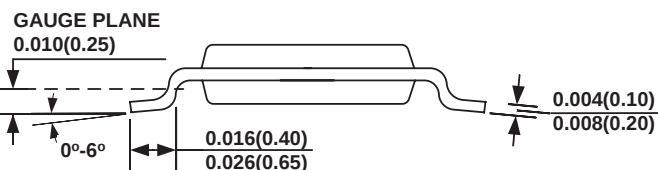
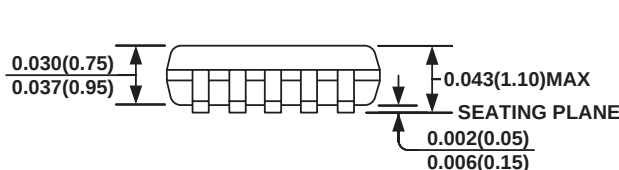
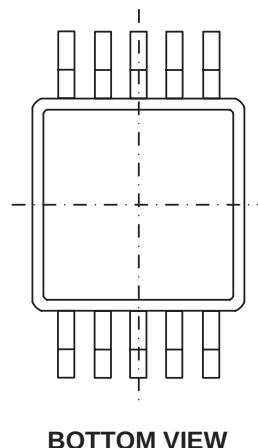
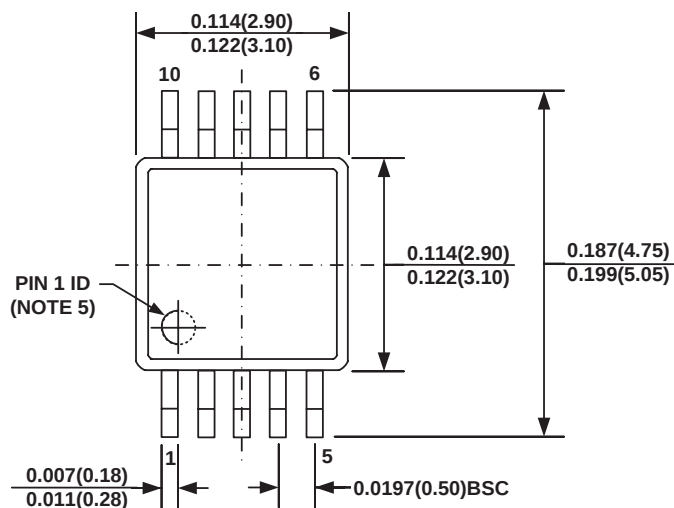
The MP3361 controlled flyback charger operates in critical conduction mode. The Output voltage is divided down through an internal 300: 1 resistive divider from the positive terminal of the transformer secondary, (FB pin) and compares it with an internal 1.2V reference. The low to high transition of the CHG pin will enable the flyback converter to switch.

A constant  $T_{OFF}$  of 20 $\mu$ s is used when the output voltage is below 20V to avoid inrush current. The boundary mode operation will follow to minimize charge time when the output voltage is above 20V. A minimum  $T_{OFF}$  of 200ns serves as

blanking for turn off transition. The circuit will stop switching and RDYB will be pulled low once the flash capacitor is charged to 300V, a value set by the internal 300:1 R divider and 1.2V reference. When the charge is full, the part will shut down its internal circuitry with less than 1 $\mu$ A drawn from  $V_{IN}$ . Toggling the CHG pin will start the charge cycle again. Bringing CHG pin low terminates the power delivery and puts the part in shutdown. A maximum  $T_{ON}$  timer prevents pulling current from a depleted battery. If the ON time exceeds maximum  $T_{ON}$ , the switch is forced OFF regardless of  $I_{PEAK}$  detection.

# PACKAGE INFORMATION

## MSOP10



### NOTE:

- 1) CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
- 2) PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR.
- 3) PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION.
- 4) LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
- 5) PIN 1 IDENTIFICATION HAS THE HALF OR FULL CIRCLE OPTION.
- 6) DRAWING MEETS JEDEC MO-817, VARIATION BA.
- 7) DRAWING IS NOT TO SCALE.

### RECOMMENDED LAND PATTERN

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